

**We Claim:**

1. An organometallic complex of the formula



where M is selected from the group consisting of Cu, Ag and Au;

$D_o$  is selected from the group consisting of ethers, phosphines, olefins, sulfides, pyridines, carbonyl, hydroxyl, cyclopentadiene, benzene derivatives, allyls, alkyls, amines, polyamines, aniline derivatives, cyclooctadiene and combinations thereof;

n is an integer having a value from 0 to 4;

k is an integer having a value from 1 to 4;

x is an integer having a value from 1 to 4; and

L is an amidinate ligand of the formula



where  $R^1$ ,  $R^2$  and  $R^3$  are selected from the group consisting of alkyls, allyls, aryls, heteroaryls, hydrogen, non-metals and metalloids; and where  $R^1$ ,  $R^2$  and  $R^3$  are different or the same.

2. The organometallic complex of claim 1 wherein  $R^1$  and  $R^3$  are the same and are selected from the group consisting of  $^t\text{Bu}$  and  $^i\text{Pr}$ .

3. An organometallic complex of the formula



where M is selected from the group consisting of Cu, Ag and Au;

where n and x are integers and  $n + x \leq 7$ ;

where L is an amidinate ligand of the formula



where  $R^1$ ,  $R^2$  and  $R^3$  are selected from the group consisting of alkyls, allyls, aryls, heteroaryls, hydrogen, non-metals and metalloids; and where  $R^1$ ,  $R^2$  and  $R^3$  are different or the same.

4. The organometallic complex of claim 3 wherein  $R^1$  and  $R^3$  are the same and are selected from the group consisting of  $t$ Bu and  $i$ Pr.
5. The use of an organometallic complex according to claim 4 for the deposition of the metal M of claim 3 by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
6. The use of an organometallic complex according to claim 1 for the deposition of the metal M of claim 1 by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
7. The use of an organometallic complex according to claim 3 for the deposition of the metal M of claim 3 by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
8. The use of an organometallic complex according to claims 6 or 7 wherein the deposition process is chemical vapor deposition or chemical vapor deposition coupled with a physical deposition technique.
9. A method for depositing a metal including the steps of:
  - i) heating a substrate onto which deposition of said metal is to occur, said substrate being located in a deposition chamber;
  - ii) producing a vapor of a precursor of the formula
 
$$[(D_o)_n ML_x]_k$$
 where M is selected from the group consisting of Cu, Ag and Au;
 

$D_o$  is selected from the group consisting of ethers, phosphines, olefins, sulfides, pyridines, carbonyl, hydroxyl, cyclopentadiene, benzene derivatives, allyls, alkyls, amines, polyamines, aniline derivatives, cyclooctadiene and combinations thereof;

n is an integer having a value from 0 to 4;

k is an integer having a value from 1 to 4;

x is an integer having a value from 1 to 4; and

L is an amidinate ligand of the formula



where  $R^1$ ,  $R^2$  and  $R^3$  are selected from the group consisting of alkyls, allyls, aryls, heteroaryls, hydrogen, non-metals and metalloids; and

where  $R^1$ ,  $R^2$  and  $R^3$  are different or the same,

in the chamber in the vicinity of the substrate; and

iii) decomposing the vapor to deposit the metal on the substrate.

10. A method for depositing a metal including the steps of:

i) heating a substrate onto which deposition of said metal is to occur, said substrate being located in a deposition chamber;

ii) producing a vapor of a precursor of the formula



where M is selected from the group consisting of Cu, Ag and Au;

where n and x are integers and  $n + x \leq 7$ ;

where L is an amidinate ligand of the formula



where  $R^1$ ,  $R^2$  and  $R^3$  are selected from the group consisting of alkyls, allyls, aryls, heteroaryls, hydrogen, non-metals and metalloids; and

where  $R^1$ ,  $R^2$  and  $R^3$  are different or the same, in the chamber in the vicinity of the substrate; and

iii) decomposing the vapor to deposit the metal on the substrate.

11. The use of an organometallic complex according to claims 1 or 3 with oxygen or a chemical source of oxygen for the deposition of metal oxides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.

12. The use of an organometallic complex according to claims 1 or 3 with sulfur or a chemical source of sulfur for the deposition of metal sulfides of the metal M of claim

- 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
13. The use of an organometallic complex according to claims 1 or 3 with boron or a chemical source of boron for the deposition of metal borides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
  14. The use of an organometallic complex according to claims 1 or 3 with silicon or a chemical source of silicon for the deposition of metal silicides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
  15. The use of an organometallic complex according to claims 1 or 3 with ammonia or a chemical source of nitrogen for the deposition of metal nitrides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
  16. The use of an organometallic complex according to claims 1 or 3 with a chemical source of carbon for the deposition of metal carbides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
  17. The use of an organometallic complex according to claims 1 or 3 with phosphine or a chemical source of phosphorous for the deposition of metal phosphides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
  18. The use of an organometallic complex according to claims 1 or 3 with arsine or a chemical source of arsenic for the deposition of metal arsenides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.

19. The use of an organometallic complex according to claims 1 or 3 with hydrogen selenide or a chemical source of selenium for the deposition of metal selenides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
20. The use of an organometallic complex according to claims 1 or 3 with hydrogen telluride or a chemical source of tellurium for the deposition of metal tellurides of the metal M of claim 1, by the use of heat, light, ultrasound, radiation, high energy particles, reactive gases or combinations thereof.
21. The use of a combination of two or more metal complexes according to claim 1 or 3 to produce alloys of the metals M of the metal complexes.